New 1km AVHRR Satellite Mosaic Supports Qualitative Global Land Visualizations*

Thomas L Logan Ph.D (NASA Jet Propulsion Laboratory, Pasadena, CA 91109-8099; 818-354-4032; e-mail: tom.logan@jpl.nasa.gov); Nevin A Bryant Ph.D (NASA Jet Propulsion Laboratory, Pasadena, CA 91109-8099; 818-354-7236; e-mail: nevin.bryant@jpl.nasa.gov); (Sponsor: Vincent Realmuto)

As part of its continuing charter "For the increase and diffusion of geographic knowledge," the National Geographic Society (NGS) endorsed the development of a new 1km resolution digital satellite mosaic of the Earth. Funded through NGS's for-profit National Geographic Ventures (NGV) subsidiary, the work was recently completed by the Jet Propusion Laboratory's Cartographic Applications Group through the Caltech Technology Affiliates Program, a technology transfer and exchange initative.

The purpose of the mosaic and associated database is to provide qualitative maps and visualizations of the global Earth in support of NGS educational programs, maps, atlases, and television specials. It is a major element of the current NGS "Millennium" series and a proposed component of Vice President Gore's "Digital Earth" initative.

The full database includes NOAA/AVHRR (Advanced High Resolution Radiometer) Visual and Infrared bands, co-registered Digital Elevation Model (DEM), shaded relief displays, a land/water mask, GEOSAT-based ocean floor representations, ETOP05-based bathymetry, and additional support layers.

Derived from both ascending and descending satellite imagery, the goal of the mosaic was to minimize clouds and snow, maintain data integrity, yet provide a seamless visual display between adjacent and overlapping AVHRR images. An additional technical goal was to maximize the use of computer automation during the preparation of the mosaic. This was accomplished by using JPL's VICAR image processing system followed by manual adjustments using the commercial Adobe Photoshop software.

The key mosaic processing steps included: 1) Selection of several hundred minimum-cloud scenes using the USGS's GLIS browsing system; 2) Removal of sun and scan angle brightness errors; 3) Use of an AVHRR Thermal and Visual wavelength cloud mask; 4) Geometric "rubber sheeting" of the AVHRR images to Geographic (rectangular) projection; 5) Geographic adjustment of images to properly fit within WVS (World Vector Shoreline) continental coastlines; 6) Automated image matching between overlapping AVHRR scenes; 7) Preparation of a "base" mosaic from Step 6; 8) Brightness adjustment of individual scenes in the base mosaic; 9) Automated registration and brightness correction of new scenes to match the base mosaic and fill holes; 10) Manual editing of the combined mosaic; and 11) Colorization of the AVHRR's default red-

based "false color" to green-based "natural Earth" tones. An existing USGS AVHRR satellite dataset was used for Antarctica.

In subsequent processing of the data, the mosaic has been converted to various map projections including Twinkle-Triple and Polar Stereographic, and merged with GEOSAT and Bathymetric datasets to produce scientific visualizations of the Earth.

Mosaic Characteristics:
21600 Lines (Rows) by 43200 Samples (Columns).
1.1km horizontal resolution (at the Equator); 30 arcseconds global.
Plate Carree (Rectangular; Geographic) Projection.
AVHRR Channels 1 (.58-.68u) and 2 (.725-1.1u); colorized.
AVHRR Scene Dates 1985-1996; Average 1991.

---

* The work described in this abstract was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under NASA Contract NAS7-1260, through the Technology Affiliates Program.

1. AGU 1998 Fall Meeting
2. 00821784 V. Realmuto
3. (a) Thomas Logan, NASA/JPL, M/S 168/527,
   4800 Oak Grove Drive, Pasadena, CA 91109
   (b) 818-354-4032
   (c) 818-354-8982
   (d) tom.logan@jpl.nasa.gov
4. U
5. (a) U18 Science Data and Information Systems
   (b) 1640 Remote Sensing
   1699 General
   6605 Education
6. Poster
7. 0%
8. PO: Contact L. Goforth 1-818-3545448
9. C
10. NONE
11. No